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Facility name: <u>Anschutz Madison Mine Site</u>	
Location: <u>East Marvin Avenue, Fredericktown, Missouri</u>	
EPA Region: <u>VII</u>	
Person(s) in charge of the facility: <u>Doug Boscheinen, Plant Manager</u>	
Name of Reviewer: <u>June Sullens</u>	Date: <u>10-14-86</u>
General description of the facility: (For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)	
<u>The site consists of 1800 acres of tailings piles, old mill works,</u>	
<u>mine shafts, and abandoned buildings. It is located in the old lead</u>	
<u>belt of Missouri, near the City of Fredericktown. The area has</u>	
<u>been mined extensively for various metals since 1847. It is now</u>	
<u>largely abandoned. Groundwater contamination is likely, and</u>	
<u>sampling has shown migration of contamination via a drainage which</u>	
<u>empties into the Saline Creek.</u>	
Scores: $S_M = 30.6$ $S_{gw} = 53.0$ $S_{sw} = 0.00$ $S_a = 0.00$	
$S_{FE} =$	
$S_{DC} =$	

FIGURE 1  
HRS COVER SHEET

07LT

40407308

1.0



Superfund

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Ground Water Route Work Sheet						
Rating Factor	Assigned Value (Circle One)	Multi- plier	Score	Max. Score	Ref. (Section)	
<b>1</b> Observed Release	<b>0</b> 45	1	0	45	3.1	
If observed release is given a score of 45, proceed to line <b>4</b> . If observed release is given a score of 0, proceed to line <b>2</b> .						
<b>2</b> Route Characteristics					3.2	
Depth to Aquifer of Concern	0 1 <b>2</b> 3	2	4	8		
Net Precipitation	0 1 <b>2</b> 3	1	2	3		
Permeability of the Unsaturated Zone	0 <b>1</b> 2 3	1	1	3		
Physical State	0 1 2 <b>3</b>	1	3	3		
Total Route Characteristics Score			10	15		
<b>3</b> Containment	0 1 2 <b>3</b>	1	3	3	3.3	
<b>4</b> Waste Characteristics					3.4	
Toxicity/Persistence	0 3 6 9 12 15 <b>18</b>	1	18	18		
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 <b>8</b>	1	8	8		
Total Waste Characteristics Score			26	26		
<b>5</b> Targets					3.5	
Ground Water Use	0 1 2 <b>3</b>	3	9	9		
Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 24 <b>30</b> 32 35 40	1	30	40		
Total Targets Score			39	49		
<b>6</b> If line <b>1</b> is 45, multiply <b>1</b> x <b>4</b> x <b>5</b> If line <b>1</b> is 0, multiply <b>2</b> x <b>3</b> x <b>4</b> x <b>5</b>			30420	57,330	.5306	
<b>7</b> Divide line <b>6</b> by 57,330 and multiply by 100			S <sub>gw</sub> = 53.06			

**FIGURE 2**  
**GROUND WATER ROUTE WORK SHEET**

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Surface Water Route Work-Sheet						
Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)	
<b>1</b> Observed Release	<u>0</u> 45	1	0	45	4.1	
If observed release is given a value of 45, proceed to line <b>4</b> . If observed release is given a value of 0, proceed to line <b>2</b> .						
<b>2</b> Route Characteristics					4.2	
Facility Slope and Intervening Terrain	<u>0</u> 1 2 3	1	0	3		
1-yr. 24-hr. Rainfall	0 1 2 <u>3</u>	1	3	3		
Distance to Nearest Surface Water	0 1 <u>2</u> 3	2	4	8		
Physical State	0 1 2 <u>3</u>	1	3	3		
Total Route Characteristics Score			10	15		
<b>3</b> Containment	0 1 2 <u>3</u>	1	3	3	4.3	
<b>4</b> Waste Characteristics					4.4	
Toxicity/Persistence	0 3 6 9 12 15 <u>18</u>	1	18	18		
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 <u>8</u>	1	8	8		
Total Waste Characteristics Score			26	26		
<b>5</b> Targets					4.5	
Surface Water Use	<u>0</u> 1 2 3	3	0	9		
Distance to a Sensitive Environment	<u>0</u> 1 2 3	2	0	6		
Population Served/Distance to Water Intake Downstream	<u>0</u> 4 8 8 10 12 16 18 20 24 30 32 35 40	1	0	40		
Total Targets Score			0	55		
<b>6</b> If line <b>1</b> is 45, multiply <b>1</b> x <b>4</b> x <b>5</b> If line <b>1</b> is 0, multiply <b>2</b> x <b>3</b> x <b>4</b> x <b>5</b>			0	64,350		
<b>7</b> Divide line <b>6</b> by 64,350 and multiply by 100			S <sub>sw</sub> = 0.00			

**FIGURE 7**  
**SURFACE WATER ROUTE WORK SHEET**

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Air Route Work Sheet						
Rating Factor	Assigned Value (Circle One)	Multi- plier	Score	Max. Score	Ref. (Section)	
<b>1</b> Observed Release	<b>0</b> 45	1	0	45	5.1	
Date and Location:						
Sampling Protocol:						
If line <b>1</b> is 0, the $S_a = 0$ . Enter on line <b>5</b> . If line <b>1</b> is 45, then proceed to line <b>2</b> .						
<b>2</b> Waste Characteristics					5.2	
Reactivity and Incompatibility	0 1 2 3	1		3		
Toxicity	0 1 2 3	3		9		
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8		
Total Waste Characteristics Score				20		
<b>3</b> Targets					5.3	
Population Within 4-Mile Radius	0 9 12 15 18 21 24 27 30	1		30		
Distance to Sensitive Environment	0 1 2 3	2		6		
Land Use	0 1 2 3	1		3		
Total Targets Score				39		
<b>4</b> Multiply <b>1</b> x <b>2</b> x <b>3</b>			0	35,100		
<b>5</b> Divide line <b>4</b> by 35,100 and multiply by 100			$S_a = 0.00$			

FIGURE 9  
AIR ROUTE WORK SHEET

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	s	s <sup>2</sup>
Groundwater Route Score (S <sub>gw</sub> )	53.06	2815.36
Surface Water Route Score (S <sub>sw</sub> )	0.00	0.00
Air Route Score (S <sub>a</sub> )	0.00	0.00
$S_{gw}^2 + S_{sw}^2 + S_a^2$		2815.36
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2}$		53.06
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2} / 1.73 = S_M =$		30.67

FIGURE 10  
WORKSHEET FOR COMPUTING S<sub>M</sub>

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Fire and Explosion Work Sheet						
Rating Factor	Assigned Value (Circle One)	Multi- plier	Score	Max. Score	Ref. (Section)	
<b>1</b> Containment	1                      3	1		3	7.1	
<b>2</b> Waste Characteristics					7.2	
Direct Evidence	0                      3	1		3		
Ignitability	0 1 2 3	1		3		
Reactivity	0 1 2 3	1		3		
Incompatibility	0 1 2 3	1		3		
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8		
Total Waste Characteristics Score				20		
<b>3</b> Targets					7.3	
Distance to Nearest Population	0 1 2 3 4 5	1		5		
Distance to Nearest Building	0 1 2 3	1		3		
Distance to Sensitive Environment	0 1 2 3	1		3		
Land Use	0 1 2 3	1		3		
Population Within 2-Mile Radius	0 1 2 3 4 5	1		5		
Buildings Within 2-Mile Radius	0 1 2 3 4 5	1		5		
Total Targets Score				24		
<b>4</b> Multiply <b>1</b> x <b>2</b> x <b>3</b>				1,440		
<b>5</b> Divide line <b>4</b> by 1,440 and multiply by 100			SFE =			

**FIGURE 11**  
**FIRE AND EXPLOSION WORK SHEET**

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Direct Contact Work Sheet						
Rating Factor	Assigned Value (Circle One)		Multi- plier	Score	Max. Score	Ref. (Section)
<b>1</b> Observed Incident	0	45	1		45	8.1
If line <b>1</b> is 45, proceed to line <b>4</b> If line <b>1</b> is 0, proceed to line <b>2</b>						
<b>2</b> Accessibility	0	1 2 3	1		3	8.2
<b>3</b> Containment	0	15	1		15	8.3
<b>4</b> Waste Characteristics Toxicity	0	1 2 3	5		15	8.4
<b>5</b> Targets						8.5
Population Within a 1-Mile Radius	0	1 2 3 4 5	4		20	
Distance to a Critical Habitat	0	1 2 3	4		12	
Total Targets Score					32	
<b>6</b> If line <b>1</b> is 45, multiply <b>1</b> x <b>4</b> x <b>5</b> If line <b>1</b> is 0, multiply <b>2</b> x <b>3</b> x <b>4</b> x <b>5</b>					21,600	
<b>7</b> Divide line <b>6</b> by 21,600 and multiply by 100				SDC =		

**FIGURE 12**  
**DIRECT CONTACT WORK SHEET**

DOCUMENTATION RECORDS  
FOR  
HAZARD RANKING SYSTEM

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INSTRUCTIONS: As briefly as possible summarize the information you used to assign the score for each factor (e.g., "Waste quantity - 4,230 drums plus 800 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference.

FACILITY NAME: Madison Mine (Anschutz Mining Corp.)

LOCATION: East Marvin Avenue, Fredericktown, Missouri

DATE SCORED: October 14, 1986

PERSON SCORING: June Sullens

PRIMARY SOURCE(S) OF INFORMATION (e.g., EPA region, state, FIT, etc.):

State files

FACTORS NOT SCORED DUE TO INSUFFICIENT INFORMATION:

Air route

COMMENTS OR QUALIFICATIONS:

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## GROUND WATER ROUTE

### 1. OBSERVED RELEASE

Contaminants detected (5 maximum):

Not sampled; therefore, no observed release.

Rationale for attributing the contaminants to the facility:

N/A

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### 2. ROUTE CHARACTERISTICS

#### Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

Bonterre Formation aquifer (References 1 and 2)

Depth(s) from the ground surface to the highest seasonal level of the saturated zone [water table(s)] of the aquifer of concern:

Estimated 30 feet to 40 feet (Ref. 1)

Depth from the ground surface to the lowest point of waste disposal/storage:

Zero feet. There is no documentation of waste disposal below ground level. In fact, the ponds are elevated above the surrounding area and the valleys have been filled in with tailings. (Ref. 11)

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### Net Precipitation

Mean annual or seasonal precipitation (list months for seasonal):

44 inches mean annual precipitation. (Ref. 3)

Mean annual lake or seasonal evaporation (list months for seasonal):

37 inches mean annual lake evaporation (Ref. 6, page 13)

Net precipitation (subtract the above figures):

44 - 37 = 7" net precipitation

### Permeability of Unsaturated Zone

Soil type in unsaturated zone:

Red residual clay containing cherts and other rock fragments.  
(Ref. 4, 5, 8)

Permeability associated with soil type:

$10^{-5}$  to  $10^{-7}$  cm/sec (estimate)  
(Ref. 6, page 15)

### Physical State

Physical state of substances at time of disposal (or at present time for generated gases):

Liquid. The tailings were placed either in ponds as a slurry or on the ground surface as solids (Ref. 13, page 6)

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### 3. CONTAINMENT

#### Containment

Method(s) of waste or leachate containment evaluated:

Piles uncovered, waste unconsolidated, and no liner.  
Surface impoundment, no liner. (Ref. 11)

Method with highest score:

Both score equally high. (Ref. 6)

### 4. WASTE CHARACTERISTICS

#### Toxicity and Persistence

Compound(s) evaluated:

PCB-1254  
Cadmium (Ref. 9)  
Chromium  
Lead  
Arsenic

Compound with highest score:

All score equally high (Ref. 6)

#### Hazardous Waste quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (Give a reasonable estimate even if quantity is above maximum):

Estimated to be very much greater than 2500 tons

Basis of estimating and/or computing waste quantity:

The property consists of 1000 acres of tailings piles, old mill works, mine shafts, and advanced abandoned buildings. Over 5,000,000 tons of metal was produced from 1845 to 1961 and tailins of various concentrations were deposited throughout the site. (Ref. 11 and 13)

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## 5. TARGETS

### Ground Water Use

Use(s) of aquifer(s) of concern within a 3-mile radius of the facility:

Drinking water: no municipal water from alternate unthreatened sources presently available. (Ref. 1 and 2)

### Distance to Nearest Well

Location of nearest well drawing from aquifer of concern or occupied building not served by a public water supply:

Adjacent to site (Ref. 7)

Distance to above well or building:

0.1 mile (Ref. 7)

### Population Served by Groundwater Wells Within a 3-Mile Radius

Identified water-supply well(s) drawing from aquifer(s) of concern within a 3-mile radius and populations served by each:

1700 people draw from the Bonterre Formation. The people using public water supplies have not been included in this count since they are served by a reservoir about 2.5 miles northwest of the site. (Ref. 5 and 7)

Computation of land area irrigated by supply well(s) drawing from aquifer(s) of concern within a 3-mile radius, and conversion to population (1.5 people per acre):

None

Total population served by groundwater within a 3-mile radius:

1700 (Ref. 7)

## SURFACE WATER ROUTE

## 1. OBSERVED RELEASE

Contaminants detected in surface water at the facility or downhill from it (5 maximum):

None. Sample 06-2033, soil sample from drainage below mining company, and sample 06-2035, water sample from drainage off site showed significant contamination. No background sample of drainage was obtained. Material is migrating, but it is not know if it has migrated to Saline Creek, approximately one mile from the two sample locations. (Ref. 9)

Rationale for attributing the contaminants to the facility:

N/A

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## 2. ROUTE CHARACTERISTICS

Facility Slope and Intervening Terrain

Average slope of facility in percent:

Hillside has slopes of 5-15% (Ref. 7, 8)  
An average of 10% is used.

Name/description of nearest downslope surface water:

Unnamed tributary to Saline Creek. Valley extensively altered in upper watershed by mining activities. The stream is gaining below the site. (Ref. 7, 8)

Average slope of terrain between facility and above-cited surface water body in percent:

Estimate about 2-3% (Ref. 7)

Is the facility located either totally or partially in surface water?

No (Ref. 7)

Is the facility completely surrounded by areas of higher elevation?

No. (Ref. 7. 0)

1-Year 24-Hour Rainfall in Inches

3.1" (Ref. 6. page 33)

Distance to Nearest Downslope Surface Water

Approximately 1/2 mile from sample locations 06-2033 and 06-2035 (near Marvin Avenue) to Saline Creek. (Ref. 7)

Physical State of Waste

Liquid (Ref. 9, 11)

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3. CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Surface impoundment, diking unsound. On page 3 of site inspection narrative report, it is stated that the lakes will overflow during flood conditions and cause damage to Saline Creek and possibly to the Little St. Francois River. The diking was also cut to facilitate run-off.

Waste piles not covered, wastes unconsolidated, and no diversion system. The site inspection narrative report states, on page 3, that the area has been graded to expedite surface water run-off from the property. Page 4 notes that a large tailings pile was observed to be eroding and discharging into the same ditch as the black ponds.

Method with highest score:

Waste piles not covered, wastes unconsolidated, and no diversion of contaminant.

or Surface impoundment, leaking, with unsound diking.

Both score equally high. (Ref. 6)

#### 4. WASTE CHARACTERISTICS

##### Toxicity and Persistence

Compound(s) evaluated

PCB - 1254 (ref 9)  
Cadmium  
Chromium  
Lead  
Arsenic

Compound with highest score:

All scores equally high (ref 6)

##### Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (Give a reasonable estimate even if quantity is above maximum):

Estimated to be very much greater than 2500 tons.

Basis of estimating and/or computing waste quantity:

The property consists of 1800 acres of tailings piles, old mill works, mine shafts, and abandoned buildings. Over 5,000,000 tons of metal was produced from 1845 to 1961 and tailings of various concentrations were deposited throughout the site. (ref 11).

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#### 5. TARGETS

##### Surface Water Use

Use(s) of surface water within 3 miles downstream of the hazardous substance:

None (ref 7,11)

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Is there tidal influence?

No. (ref 7)

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

None (ref 12)

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

None (ref 12)

Distance to critical habitat of an endangered species or national wildlife refuge, if 1 mile or less:

None (ref 12)

Population Served by Surface Water

Location(s) of water-supply intake(s) within 3 miles (free-flowing bodies) or 1 mile (static water bodies) downstream of the hazardous substance and population served by each intake:

None (ref 7) The City of Fredericktown is supplied water from a reservoir located about 2.5 miles northwest of the site. This reservoir is not expected to be affected by discharges from Madison Mine as the Saline Creek drains into the Little St. Francis River downstream of the reservoir. The Little St. Francis drains south and west to the St. Francis River.

Computation of land area irrigated by above-cited intake(s) and conversion to population (1.5 people per acre):

N/A

*Document*

Total population served:

N/A

Name/description of nearest of above water bodies:

N/A

Distance to above-cited intakes, measured in stream miles.

No water supply intakes

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AIR ROUTE  
NOT EVALUATED

1. OBSERVED RELEASE

Contaminants detected:

Air route not sampled.

Date and location of detection of contaminants

Methods used to detect the contaminants:

Rationale for attributing the contaminants to the site:

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2. WASTE CHARACTERISTICS

Reactivity and Incompatibility

Most reactive compound:

Most incompatible pair of compounds:

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Toxicity

Most toxic compound:

Hazardous Waste Quantity

Total quantity of hazardous waste:

Basis of estimating and/or computing waste quantity:

\* \* \*

3 TARGETS

Population Within 4-Mile Radius

Circle radius used, give population, and indicate how determined:

0 to 4 mi      0 to 1 mi      0 to 1/2 mi      0 to 1/4 mi

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

Distance to critical habitat of an endangered species, if 1 mile or less:

Land Use

Distance to commercial/industrial area, if 1 mile or less:

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

Distance to residential area, if 2 miles or less:

Distance to agricultural land in production within past 5 years, if 1 mile or less:

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

Is a historic or landmark site (National Register or Historic Places and National Natural Landmarks) within the view of the site?

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# REFERENCES

- | Reference # | Description of Reference  |
|-------------|---|
| 1.          | Well logs, T. 33 N., R. 7 E., Madison County, Missouri, <input type="radio"/> Missouri Geological Survey.   |
| 2.          | Groundwater Maps of Missouri, March, 1963, Missouri <input type="radio"/> Geological Survey.  |
| 3.          | Missouri Water Atlas, 1982. <input type="radio"/>   |
| 4.          | Preliminary Geological Map of the Fredericktown District, by Dan R. Stewart and Kenneth Aid, 1943, <input type="radio"/> Missouri Geological Survey.  |
| 5.          | Mining and Milling Methods and Costs, Madison Mine, National Lead Company, St. Louis Smelting and Refining <input type="radio"/> Division, Madison County, Missouri, Bureau of Mines Information Circular 8028, 1961. |
| 6.          | Uncontrolled Hazardous Waste Site Ranking System, A <input checked="" type="checkbox"/> Users Manual, The MITRE Corp., August, 1982.  |
| 7.          | Topographic Map, Fredericktown 7 1/2' Quadrangle, U.S. <input checked="" type="checkbox"/> Geological Survey, 1980 edition.   |
| 8.          | Personal Observation - field investigation April 7, <input checked="" type="checkbox"/> 1986.   |
| 9.          | Laboratory Data compiled by Laboratory Services of the <input checked="" type="checkbox"/> Missouri Department of Natural Resources.  |
| 10.         | N.P.L. Quality Assurance team worksheet. State files. <input type="radio"/>   |
| 11.         | Personal Observation - site investigation February 25, <input type="radio"/> 1986.  |
| 12.         | State Files. 3.500 Madison Co. Anschutz. <input type="radio"/>  |

## X. APPENDIX

### References

Sax, Irving N., Dangerous Properties of Industrial Materials  
Von Nostrand Reinhold Co., 1979 5th ed.

U.S.G.S. Topographical Map, 7.5 minute series. Fredericktown  
Quadrangle, 1980.

Uncontrolled Hazardous Waste Site Ranking System, A Users  
Manual, The MITRE Corp., August 1982.

State Files. Poplar Bluff Regional Office, Missouri  
Department of Natural Resources. 3.500 Madison County,  
Anschutz Corp.